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UP-TO-DATE TECHNOLOGIES ON EUROPEAN RAILWAYS

Nowadays one can hardly find fields in rail engineering where electronic machines or devices are not used. Traffic control, sorting yard operations, compiling schedules, designing locomotives and many other hard and time-consuming jobs are being increasingly performed by sophisticated electronic systems.

The automation of railway services is leading to computer-integrated railroading, in which radio plays a very important role. On modern railways there is a clear trend towards the so-called railway operation control system (ROC) based on radio transmission. ROC includes traffic safety and train control, which supersedes traditional signaling [1, c. 46]. It helps to coordinate the operation of high-speed passenger services and slower freight trains on the same tracks, as well as the use of double-track lines in both directions. It is with the help of ROC that trains are virtually or electronically coupled into a chain driving at a high speed. Together with 'smart' trains and 'intelligent' dispatching and control centers, ROC forms a triangle for improved profitability for the railways.

A second trend, which becomes visible, is increasing standardization. Within Europe, there exist 27 different signalling systems, five different types of electrification, different track and loading gauges, and different operating rules between national railways. It stands to reason, that signalling and train control systems have to be interoperable to ensure the safe and smooth flow of rail transport. With this aim, the European Rail Traffic Management System (ERTMS*)* has been designed. It is aimed at 'Europeanizing' national signalling systems and improving cross-border traffic so that the driver will always receive the same signalling information regardless of which country he is operating at the time. As all major signalling companies are involved in the development of ERTMS, it will soon be a radio-signalling standard for the world [3, c. 24].

New developments in information technology and ever-expanding Internet have changed the world and the way of presenting passenger information. Passengers, railway operators and other railway companies can freely transmit, collect, and process the information. Passengers receive personalized travel plans, and railway operators can offer services according to demand. Electronic smart card ticketing and booking tickets on the Internet have become a regular thing for passengers. It is the most innovative example of mass fare collection and payment. Automatic fare collection (AFC) is a response to the need for fast control and fast money transfer in a short time and in a secure environment to improve the flow of passengers through a public transport network. Other benefits include ease of use, increased reliability of terminals and cards, and reduced maintenance costs.

Moreover, an interoperable electronic ticketing system offers the public greater freedom and seamless journeys, as well as opening the door to collaboration with other service providers and banks. New technologies in electronic ticketing provide the opportunity to develop new applications. Interactive television, encryption, biometrics,

mobile telephony, MMS and text messaging have reached various stages of development and all of them open the door to new means of access control, prepaid tickets, single tickets and integration with customer relations. Mobile telephony has already demonstrated what can be achieved by people getting together to define a global open standard. More and more countries are adopting smartcards with embedded chip instead of paper-based ticketing systems. Smartcards hold much more information than a magnetic stripe, and can be also used outside the mass transit systems for which they were designed, for instance, as 'electronic purses'. For example, in Hong Kong car parking can be paid for by a debit from a smart card – and the same card will also serve as a ticket on the Mass Transit Railway. In Netherlands the multimodal contactless e-ticketing system is being introduced on a national scale. The system uses a rechargeable smartcard enabling passengers to move easily between all forms of public transport: trains, buses, trams, metros and ferries. Passengers no longer need to queue to buy a ticket or pass through a gate. From contactless cards reloaded via the Internet, to virtual tickets on mobile phones – today's technology has no limits [2, c. 23].

It is safe to say that investment in rail research is paid many times over. New technologies will transform railways in the foreseeable future. In this information-intensive age, the modernization of signalling and telecommunications is even more important than the pursuit of higher train speeds. Future railway technologies have to be highly effective, interoperable, safe, environmentally friendly and allow for rapid innovation in the railway system.

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